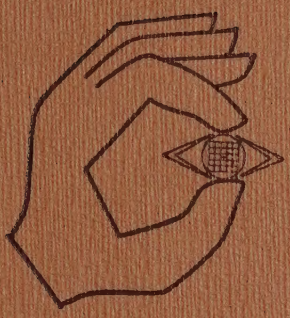

TELEQUIPMENT
OSCILLOSCOPE
TYPE D83

MAIN FRAME

MANUAL

TELEQUIPMENT

MAIN FRAME

TYPE D83

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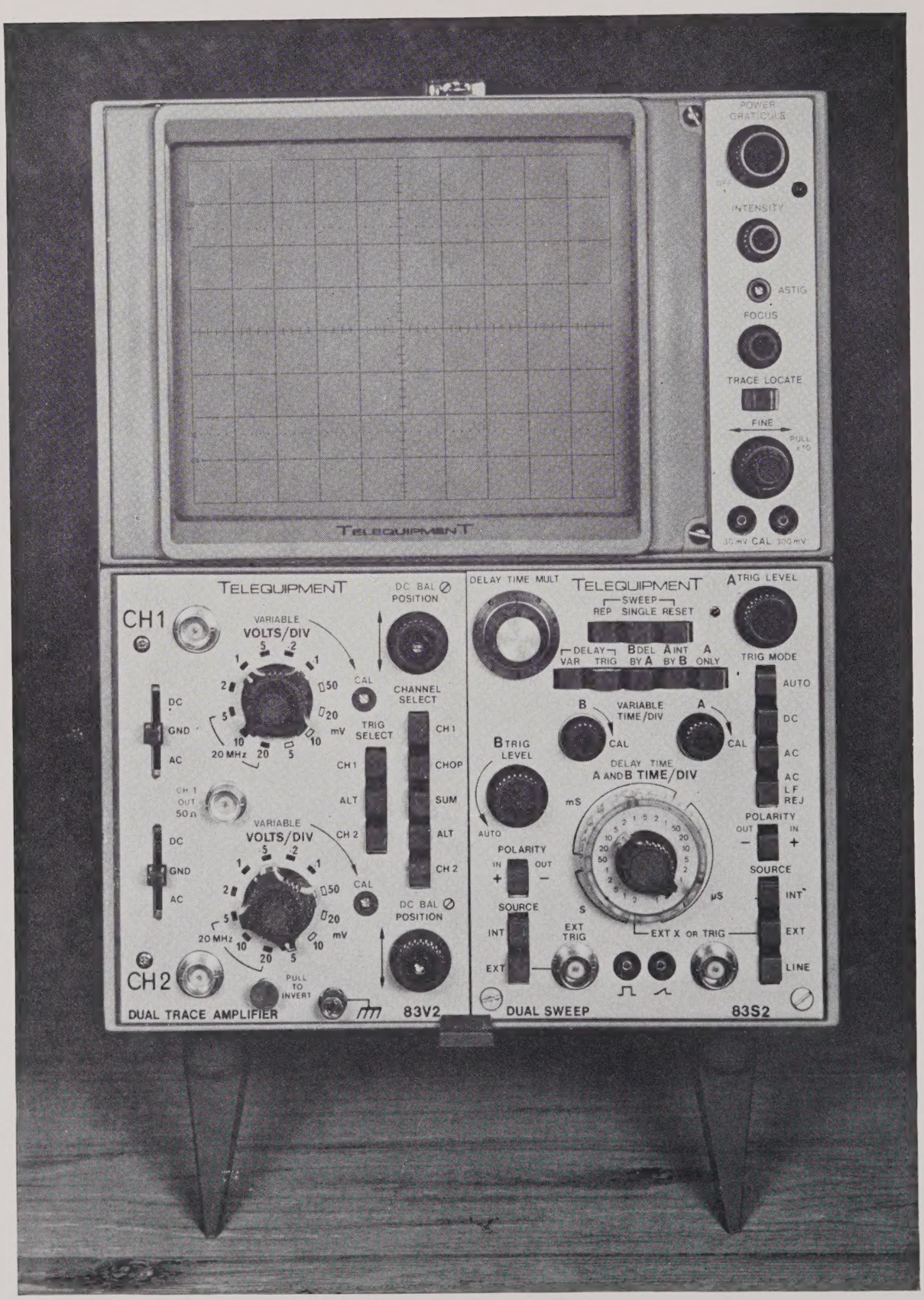
TELEQUIPMENT
POWER
GRATICULE
INTENSITY
ASTIG
FOCUS
TRACE LOCATE
FINE
PULL ×10
30 mV CAL 300 mV
TELEQUIPMENT
CH1
VARIABLE
VOLTS/DIV
DC BAL
POSITION
CAL
CHANNEL
SELECT
DC
GND
AC
TRIG
SELECT
CH1
ALT
CH1
CHOP
SUM
ALT
CH2
CH1 OUT 50Ω
20 MHz
CH2
DC BAL
POSITION
PULL TO INVERT
DUAL TRACE AMPLIFIER
83V2
DELAY TIME MULT
TELEQUIPMENT
SWEEP
REP
SINGLE RESET
DELAY
VAR
TRIG
B DEL BY A
A INT BY B
A ONLY
A TRIG LEVEL
TRIG MODE
AUTO
DC
AC
AC LF REJ
B
VARIABLE
TIME/DIV
A
CAL
CAL
B TRIG
LEVEL
AUTO
DELAY TIME
A AND B TIME/DIV
mS
μS
S
POLARITY
OUT
IN
SOURCE
INT
EXT
EXT TRIG
EXT X OR TRIG
LINE
DUAL SWEEP
83S2

INTRODUCTION

The D83, with two plug-ins, is an all solid state oscilloscope. An 8 x 10 div. CRT provides a bright and clear display. The features of the horizontal and vertical systems depend on the type of plug-ins used and are given in the appropriate manual.

The manual covers the mainframe, which houses the following:—

Calibrator
E.H.T. generator
Horizontal amplifier
Un-blanking amplifier
Vertical amplifier, output stage

This manual should be read in conjunction with the manuals of the plug-ins used. References are annotated "S" and "V" for the sweep and vertical plug-ins respectively.

The design of this instrument is subject to continuous development and improvement, consequently this instrument may incorporate minor changes in detail from the information contained herein, which would, in the main, affect the Components List and Circuit Diagrams. The reader should pay particular attention to the notes at the beginning of Chapter 5.

NOTICE TO OWNER

To obviate the risk of damage during transit and facilitate packaging, the owner is requested to remove the power supply plug and NOT send the following items unless they are suspect, should this Instrument be returned to TELEQUIPMENT for servicing:—

Manual
Probes
Power Supply Lead
Plug Assemblies

CONTENTS

1 SPECIFICATION
- Cathode Ray Tube (CRT)
- Cooling
- Outputs, Front Panel
- Power Requirements
- Size
- Temperature Limits
- Weight
- Z Mod

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- Controls and Connectors
  - Connectors
  - Controls
    - CRT
  - Operation
  - Pre-operational Checks

3 CIRCUIT DESCRIPTIONS
- Blanking Amplifier
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- E.H.T.
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- Component Reference
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CHAPTER 1
SPECIFICATION

1.1 CATHODE RAY TUBE (CRT)

Display area	8 x 10 div (each div 1·22 cm)
Phosphor Standard	P31
Overall accelerating potential ...	15 kV

1.2 FRONT PANEL OUTPUTS

Calibrator, peak to peak	30 mV or 300 mV } at 1 kHz or 3mA }
Accuracy	
Voltage	±1%
Frequency	±20%
Current	±1%

1.3 Z MOD

Full blanking sensitivity	+20 V approx
Input impedance	10 kΩ and 15 pF approx.
Frequency response	DC—5 MHz approx.

1.4 POWER REQUIREMENTS

Voltage	100-125 V in 5 V steps 200-250 V in 10 V steps
Frequency	48-400 Hz
Consumption	85 VA

1.5 SIZE

Height	290 mm
Width	215 mm
Depth	520 mm

1.6 WEIGHT ... ... 9·5 kg

with plug-ins ... ... 14 kg

1.7 COOLING ... ... Convection

1.8 TEMPERATURE LIMITS, ambient

Operating	+5 to +40°C approx.
Non-operating	−25 to +70°C approx.

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CHAPTER 2

OPERATING INSTRUCTIONS

2.1 FUNCTION OF CONTROLS AND CONNECTORS

Controls are situated on the front panel except where otherwise specified. For the controls not covered below, reference should be made to Chapter 2 of the manuals for the respective modules.

2.1.1 CRT

GRATICULE	varies the intensity of the graticule illumination and serves as the power supply ON-OFF switch.
INTENSITY	varies the intensity of the display.
ASTIG	a preset used in conjunction with FOCUS for achieving the best overall definition.
TRACE LOCATE	when pressed brings the trace onto the screen and free runs the A timebase.
←→	varies the position of the trace in the horizontal axis.
FINE	is a fine horizontal position control.
X10	when pulled magnifies trace 10 times in the horizontal axis; sweep calibrations must be divided by 10.
TRACE ROTATION	preset situated on the rear panel, rotates the trace about the horizontal axis of the CRT and used to align the trace in the horizontal axis.

2.1.2 SWEEP

"S" Manual.

2.1.3 TRIGGER

"S" Manual.

2.1.4 VERTICAL

"V" Manual.

2.1.5 CONNECTORS

Z MOD	input socket situated on the rear panel is DC coupled via Z mod amp. to the CRT grid. A negative-going signal is necessary to intensify the trace while a positive-going signal will blank it.
CAL	output sockets provide a 1 kHz waveform for checking the calibrations of the vertical channels and setting up probes. The two outputs provide 300 mV and 30 mV 1 kHz (approx.) squarewave, when linked a 3 mA peak to peak current passes.
INTERFACE	an edge connector internally situated connects the plug-ins to main-frame.

2.2 PRE-OPERATIONAL CHECKS

2.2.1 POWER SUPPLY

Check the following:

1. Correct plug-ins are plugged in.
2. Rear voltage-selector plug is indicating the local supply voltage or nearest value.
3. Fuse fitted is a 2 A for 100-125 V operation or 1 A for 200-250 V.

NOTE: The 3-core supply lead is colour coded as follows:

Line	Neutral	Earth (Chassis)
Brown	Blue	Green/Yellow

Power Cord should be secured by the screws and nuts provided to comply with local legislation.

2.2.2 Set controls as follows:

1. CRT

INTENSITY	Central
FOCUS	Central
TRACE ROTATION	As set
GRATICULE	Fully anti-clockwise

2. Set "S" plug-ins controls.
3. Set "V" plug-ins controls.

2.3 OPERATION

1. Plug into the supply; turn GRATICULE clockwise — POWER ON.
2. Allow a few minutes for warm up then press TRACE LOCATE and adjust POSITION controls for a display.
3. Adjust TRACE ROTATION, if necessary, to align trace horizontally.
4. Connect the CAL 30 mV to INPUT via co-axial lead.
5. Set DC-GND-AC to DC.
6. Rotate LEVEL anti-clockwise to lock display.
7. Check amplitude is 6 divisions.

CHAPTER 3
CIRCUIT DESCRIPTION

3.1.0 VERTICAL AMPLIFIER

3.1.1 The interface reference Figure 1 with the Vertical plug-in is a 16-way socket mounted on the Mother Board PC124. The signal is carried through pins 5 and 13 to the delay line driver amplifier, TR603 and TR604. To ensure that the main frame interface always has the same sensitivity, the gain is set by the series elements R611, R612 and the shunt elements R608, R609. The total gain adjustment is approximately 18%. This enables the input sensitivity to be set to 0·27 mA/div ±5%.

3.1.2 This amplifier is a voltage feedback stage giving low input and output impedances, i.e., 9 Ω and 11 Ω approx. The impedance of the delay line used is 93 Ω/side, and the padding resistors, R629 and R628, are used to raise the output impedance of the stage to the correct value. The feedback resistors are split to enable the delay line compensation circuits C607, R617, C608 and R621 to be inserted. These provide medium frequency peaking by reducing the feedback at these frequencies. The ALT trigger signal is taken from the low impedance output of this stage and fed through R626 and R627 to the ALT trigger amplifier TR601 and TR602. Selection of ALT trigger is achieved by a D.C. control voltage from the vertical plug-in switching the diodes D601, D602, D603 and D604; +24 V at pin 6 on SK602 selects ALT trigger and −24 V switches it off. The trigger signal is mixed with that from pins 7 and 10 on SK602 and then fed to the Sweep plug-in via pins 11 and 12 on SK601.

3.1.3 The Sum balance control, R614, is in circuit only when SUM is selected on the Vertical plug-in. When this occurs +24 V is applied to pin 14 of SK602 which switches on D605 and supplies the extra current needed in the SUM mode through R613, R614 and R615. When SUM is not selected; pin 14 is at earth potential.

3.1.4 The delay line is a twin helix type sheathed with braid having a total delay of 140 ns. It is terminated on PC125 by R701, R703 and L701. The two resistors in parallel with the input resistance of the next stage gives a terminating resistance of 186 Ω. L701, adjusted for minimum delay line termination wriggle, is a partial compensation for the input capacity of TR701 and TR702. The following stage is a long-tailed pair, TR701 and TR702, with a gain of 2 and peaking between their emitters. R711 and C703 are delay line compensation and C704 high frequency peaking.

The output stage is a cascode comprising TR703, TR704, TR705 and TR706. It has a gain of approximately 15 and runs at a current of 50 mA/side. Gain is determined by R724, R725 and R718. The components, between the emitters of TR703 and TR704, compensate for the collector time constants of TR705 and TR706 which drive the Y plates of the CRT. R719, C706, C708 and R721 are thermal compensation. Zener diodes, D702 and D703, prevent TR703 and TR704 bottoming at shift and signal extremities.

3.1.5 A portion of the output stage current is used to provide trace rotation. L702 is the trace rotation coil and R727 the preset control on the back panel of the oscilloscope. Geometry control is provided by R708 which is mounted on PC125.

3.2.0 HORIZONTAL AMPLIFIER

3.2.1 This comprises an input mixing amplifier and an overall multistage feedback amplifier. The input amplifier, TR3, reference Figure 2, has a gain of 0·5 and has low input and output impedances. It mixes the sweep with the two position controls and provides a composite signal to the main amplifier. R17, a balance control, sets the voltage at TR3 collector to centralize position controls. C5 adjusts H.F. peaking, which is set by the manufacturer.

3.2.2 The main amplifier is a voltage feedback type which has the advantage of high input and low output impedances. R32 and R31 are the feedback resistors and the gain is determined by these resistors and those between the emitters of TR4 and TR5. For X1 gain these are R26 and R27. On X10 gain R28 and R29 are put in parallel with R26 and R27. R27 sets X1 gain and R29 the X10 gain.

3.2.3 The mean X plate potential is set by R23 to approximately 55 V. D4 and D5 limit the excursion on the bases of TR6 and TR7 when X10 gain is used. The output stage TR6, TR7, TR8 and TR9 is capable of delivering large current swings into capacitance, while running at a low quiescent current. In the positive direction the emitter followers TR8 and TR9 supply the current and in the negative direction TR6 and TR7 supply the current through diodes D6 and D7. The output is push-pull, TR4 and TR5 being a phase-splitting stage.

3.3.0 UNBLANKING AMPLIFIER

In this amplifier, reference Figure 3, all unblanking signals are summed, at earth potential, in the emitter of TR351. Vbe drift is compensated for by D351. This composite signal is mixed with the intensity control current at the base of TR352 which, with TR353, forms a low input and output impedance shunt feedback amplifier. R362 and C353 are the gain and frequency response determining components, i.e., a 2 mA current change at the base of TR352 produces 48 V at the collector. A complementary emitter follower stage, TR354 and TR355, to provide the large fast transients required.

3.4.0 MOTHER BOARD PC124

All inter-connections between Vertical and Horizontal plug-ins are made on the Mother Board, which are for trigger, alternate pulse, blanking amplifier and power lines.

3.5.0 TRACE LOCATE

This is obtained by reducing the maximum swing of vertical and horizontal amplifiers and free-running the sweep. S2 performs all these functions. The vertical amplifier is compressed in the output stage and the vertical amplifier is compressed in the delay line termination stage TR701 and TR702. The sweep unit is made to free-run by applying a positive voltage to pin 13 of SK601 via a 330 kΩ resistor R602.

3.6.0 CALIBRATOR

The Calibrator, reference Figure 2, is a simple, saturating multivibrator running at approximately 1 kHz. The timing components are R1, C1, C3 and R6. The transistor TR1 switches between −24 V and earth, TR2 between −24 and +0·7 V; D2 catches TR2 collector as it aims for +24 V. The accuracy of the calibrator depends on the resistors R5, R9, R13 and the −24 V line: R4, a ±1·2% control, takes up the tolerance of R5. If SK1 and SK2 are shorted together 3 mA passes through the short circuit determined by the −24 V line and R4 + R5 + R13.

3.7.0 POWER SUPPLY

+105 V, −24 V and +24 V lines, reference Figure 4, are all stabilizing circuits and protected against short circuits.

3.7.1 +24 V Line. D405, D406, D407 and D408 form a full wave bridge circuit. R424, R425 and R426 act as a sampling chain and use the −24 V line as a reference voltage. Any attempted change in output voltage of the +24 V line is passed back to the controlling network of TR408, TR406 and TR405, which reduces the change to a very small value. TR402 and R407 provide current limiting to protect the output from short circuits.

3.7.2 −24 V Line. This is used as a reference voltage for the other two lines and it is essential that this line is set to its correct voltage. D409, D411, D412 and D413 form a full wave bridge circuit. TR411 and TR407 are a long-tailed pair and together with TR409 and TR413 stabilize the circuit. TR403 and R405 provide current limiting and protect the output from short circuits.

3.7.2 105 V Line. D401, D402, D403 and D404 provide full wave bridge rectification. This line differs from the −24 V and +24 V lines in that if a short circuit occurs in the output the instrument must be switched off and turned on again before the line can be restored to its normal voltage, TR414, TR412, TR415 and TR416 stabilize the output, TR401 and TR404 provide the short circuit protection in the form of a bistable, which is changed over by current flowing through R406.

3.8.0 E.H.T.

The E.H.T., reference Figure 3, PC129, is derived from a class C oscillator operating at approximately 24 kHz. The oscillator transistor TR304 uses transformer, T301, as its load and main frequency determining component. A feedback loop, including a high gain amplifier, TR301, TR302 and TR303, regulates the cathode supply, which is set to the correct potential by adjusting R301 and the grid set to the current tube cut-off potential by adjusting R315. Diodes D304 and D303 provide half wave rectification from T301 for the cathode and grid supplies. A five stage voltage multiplier (quintupler) provides the +12·5 kV PDA, the input to which is taken from T301 on the same tapping as that used for the cathode supply.

Thermistor TH301 limits the O/P at switch on and C304 reduces EHT feedback into the unregulated +30 V line. The tube is focussed by adjusting R327, which is on the front panel.

CHAPTER 4

4.1.0 GENERAL

4.1.1 This manual should be read in conjunction with the manuals for the plug-ins in use.

4.1.2 Before it is assumed a fault condition exists, control settings should be verified with reference to the pre-operational checks, para. 2.2. Where components are replaced, e.g., transistors, it is advised that the calibration checks detailed in para. 4.4.0 be carried out.

4.1.3 The entirely solid-state design of the instrument should render frequent re-adjustment of the internal preset controls unnecessary; however, to ensure full measurement accuracy, it is desirable to make an occasional check of the vertical amplifier sensitivity, reference 4.3.3. The internally generated 30 mV peak to peak calibrated waveform may conveniently be used for these checks.

4.2.0 MECHANICAL

4.2.1 **ACCESS TO INTERIOR**

The cabinet covers are removed as follows:—

1. Disconnect the power supply lead.
2. Turn two buttons at the top of each cover to release.
3. Ease the top of each side outwards.
4. Lift to clear bottom channel. The chassis base plate is secured by six fixing screws, one at each corner and one half-way along each side.

4.2.2 **LOCATION OF PRESET CONTROLS**

Circuit	PC Board No.	Location
Calibrator	126	R.H. side
E.H.T.	129	R.H. side
Power Supply	127	Rear end
Unblanking Amp.	128	R.H. side
X amplifier	126	R.H. side
Y amplifier output	125	L.H. side

4.2.3 **CRT REMOVAL**

1. Remove both cabinet sides, reference para. 4.2.1.
2. Earth PDA connector with a screwdriver.
3. Unplug PDA connector.
4. Remove rear cover (two screws).
5. Unplug the 14 pin CRT base connector.
6. Unplug the five neck pin connectors.
7. Remove two screws securing the bezel.
8. Slide CRT through the front panel aperture.
9. Remove rubber location moulding.

4.2.4 **CRT FITTING**

Reverse the order detailed in para 4.2.3 above.

4.3.0 CALIBRATION

4.3.1 The following procedure enables a calibration check of this unit to be accomplished. It is advised, that isolated adjustments are not made, due to risk of interaction with settings made in earlier checks. A functional check be carried out as detailed in para. 4.4 below. Checking parameters are met, then proceeding to the next check. Adjustments, if made, should be minimal.

The following tools and facilities will be required:

TOOLS

Screwdrivers	Plain 4 mm. blade.
	Non-capacitive.
Plug-in, Calibration	'V' 067-0672-00.
	'S' 067-0673-00.
Leads	Screened c/w BNC Adaptors.
Adaptors	BNC 3-way, Male/Female/Male.
	BNC/2 mm.
	Probe X10 c/w earth lead.
	Oscilloscope Monitor.

FACILITIES

Variable voltage supply (Variac).

Voltage measurement from −24 V to 2·5 kV ±0·5%.

Input Signals	Markers
Squarewave	1 ms
25 mV 1 kHz 1%	
250 mV 1 kHz 1%	
1 V 1 kHz 1%	
10 V 1 kHz 1%	
10 ns risetime 100 kHz	
25 mV 1 MHz	
250 mV 1 MHz	

4.3.2 **INITIAL CONTROL SETTINGS**

1. Disconnect the instrument from the supply.
2. Check voltage-selector plug and power cord. Reference Chapter 2.2.
3. Connect power supply lead to Variac.
4. Turn GRATICULE fully anti-clockwise.
5. Push FINE.
6. Set FINE and ←→ to mid-position.
7. Connect Variac to power supply and set to minimum.
8. Switch-on Variac and set to voltage, reference Op. 2.
9. Turn GRATICULE clockwise; adjust illumination.
10. Allow instrument to warm-up; adjust INTENSITY and FOCUS.
11. Observe Neon (speed, alight).
12. Adjust TRACE LOCATION.

Note: Reference should be made to 'S' and 'V' manual for the respective initial control settings.

4.3.3 **GAIN CHECK**

Reference should be made to the 'S' and 'V' manuals for initial control settings.

1. Set VOLTS/DIV to 5 mV.
2. Set TIME/DIV to 0·5 ms.
3. Connect CAL to 'V' Input.

Note: use screen leads.

4. Adjust LEVEL for locked display.
5. Adjust POSITION.
6. Turn GRATICULE clockwise; adjust illumination.
7. Check amplitude = 6 divs, adjust as detailed in 'V' manual, Chapter 2.

Should a second channel require checking repeat Ops. 1, 3 and 7 using corresponding controls.

4.3.4 **PROBES**

1. Repeat Op. 1 para. 4.3.3 for X10 probe. Set VOLTS/DIV to 5 mV for X1.
2. Connect BNC to 'V' input.
3. Connect probe tip to 300 mV CAL for X10 probe and 30 mV CAL for X1.
4. Set TIME/DIV to 1 ms.
5. Repeat para. 4.3.3, Op. 4 through 6.
6. Adjust probe for square corner, see probe instruction.

4.4.0 CALIBRATION PROCEDURE

4.4.1 **POWER SUPPLY**

CAUTION—High voltage lines.

1.0 Check line voltages.

1.1 Remove cabinet covers (reference para. 4.2.1) and perforated cover.

1.2 Connect Meter to location: Col. 1.

1.3 CHECK voltages: Col. 2.

1.4 Adjust to correct voltage: Col. 3.

Location		Voltage	Adjust
PC No.	Pin	V	
127	10	+ 24	R425
127	14	− 24	R428
127	9	+105	R433
129	16	− 2·5 k	R301
126	14	55	R23

2.0 Check grid cut-off.
2.1 Set TIME/DIV to 10 ms.
2.2 Rotate INTENSITY.
2.3 Observe trace black-outs.
2.4 Turn INTENSITY anti-clockwise.
2.5 Adjust R315, PC129 anti-clockwise ensure trace blacks out.
2.6 Fit perforated cover.

4.4.2 HORIZONTAL AMPLIFIER

Note: Adjustments should be minimal. Note C11 and C13 should not be altered, to set-up refer to para. 4.5.1.

1.0 Check X-shift position range.
1.1 Set TIME/DIV to 1 ms.
1.2 Turn FINE and ←→ to opposite range extremities.
1.3 Check trace ends past vertical centre line.
1.4 Adjust R17, PC126 to achieve Op. 1.3.

2.0 Check X calibration: R27, R29. PC126.
2.1a Connect 1 ms Marker Signal to 'V' Input.
b Set VOLTS/DIV to 0·2 V.
c Set DC-GND-AC to DC.
2.2 Set TIME/DIV to 1 ms.
2.3 Align leading marker and L.H. vertical.
2.4 CHECK alignment of subsequent markers; error <0·3 div.
2.5 Adjust R27, PC126, for optimum alignment.
2.6 Set Marker Generator to 0·1 ms.
2.7 Pull FINE and turn ←→ slowly.
2.8 CHECK alignment; error <0·6 div.
2.9 Adjust R29, PC126 for optimum alignment.

4.4.3 UNBLANKING AMPLIFIER

1.0 Check pulse response.
1.1 Set TIME/DIV to 0·1 μs.
1.2 Observe trace intensity for non-uniformity.
1.3 Adjust C353, PC128, for uniformity.

4.4.4 VERTICAL AMPLIFIER (Final Stage).

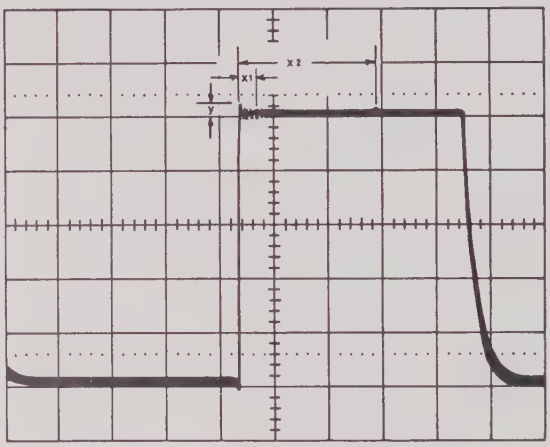
Note: Remove 'V' plug-in extension lead; fit L.H. cover; install plug-in.

1.0 Check pulse response.
Minimal adjustment only.

CAUTION: R609 and R706 should not be altered. To set-up refer to para 4.5.2.

1.1a Connect 25 mV, 1 MHz squarewave to "V" Input.
b Set VOLTS/DIV to 5 mV.
1.2 Set TIME/DIV to 0·1 μs.
1.3 CHECK trace with Plate 4.1.
1.4 If aberrations, from leading edge is:—
'X1' >0·25 div; adjust C608. PC124.
'X1' >0·1 <0·25 div, adjust C711 and R722. PC125.
'X1' <0·1 div, adjust C707. PC125.

2.0 Check delay line ripple.
2.1 CHECK top edge ripple; 'X2' <2·8 div, reference Plate 4.1.
2.2 Set C704, PC125, to mid-range.
2.3 Adjust L701, PC125, to minimize ripple.
2.4 Adjust C704 for perpendicular leading edge and 'Y' <0·1 div, reference Plate 4.1.



Refer to relevant Ops. for 'x1', 'x2' and 'y'

PLATE 4.1

4.4.5 CALIBRATOR

1.1 Check setting.
1.2a Connect 25 mV, 1 kHz squarewave to 'V' Input.
b Select 'V' Input.
c Set DC-GND-AC to DC.
d Set VOLTS/DIV to 5 mV.
e Turn VARIABLE fully clockwise.
1.3a Set TIME/DIV to 1 ms.
b Turn VARIABLE fully clockwise.
1.4 CHECK amplitude = 5 divisions.
1.5 Adjust CAL.
1.6 Connect 30 mV CAL to 'V' Input.
1.7 CHECK amplitude = 6±0·1 divisions.
1.8 Adjust R4, PC126.

2.0 Check frequency.
2.1 Set Monitor Oscilloscope (M.O.).
Volts/Div to 5 mV.
Time/Div to 1 ms.
2.2 Connect M.O. to 30 mV CAL.
2.3 CHECK display for 10 ±2 cycles.

4.4.6 GENERAL

1. Examine instrument for cleanliness.
2. Fit cabinet covers.
3. Repeat para. 4.3.2.

4.5.0 SETTING-UP

1.0 To set-up Horizontal Amplifier.
1.1 Replace 'S' plug-in with 'S' Calibration plug-in.
1.2 Set R17, R23, R27, R29, PC126, to centre of range.
1.3 Set C11, C13, PC126, with stator and rotor leafs disengaged.
1.4 Centralize FINE & ←→.
1.5 Connect 0-10 V squarewave to CAL, Test plug-in.
1.6 Adjust R17 to centralize trace.
1.7 Connect voltmeter to eyelet 14.
1.8 Adjust R23 to obtain 55 V.
1.9 Observe trace is central.
1.10 Adjust R27 to give 10 div trace.
1.11 Connect 0-1 V, 1 kHz squarewave to CAL.
1.12 Pull FINE.

1.13 Adjust R29 to give 10·2 div trace.
1.14 Push FINE.
1.15a Link CAL (calibration plug-in) to 'V' input.
b Set DC-GND-AC to DC.
v Set VOLTS/DIV to 5 V.
1.16 Connect 100 kHz, 10 ns risetime squarewave to link (Op. 1.15a).
1.17 Adjust C11 to give 2 div squarewave display.
1.18 Pull FINE.
1.19 Adjust C13 to give 2 div squarewave display.
1.20 Push FINE.
1.21 Replace 'S' Calibration plug-in with 'S' plug-in.

2.0 To set-up Vertical Amplifier.
2.1 Replace 'V' plug-in with 'V' Calibration plug-in.
2.2 Select BAL.
2.3 Adjust R706, PC125, to centralize line.
2.4 Select CAL.
2.5 Connect 250 mV, 1 kHz squarewave to INPUT.
2.6 Adjust R609, PC124, for 5 div amplitude.
Note: ±0·2 div error acceptable if at range limit.
2.7 Connect 250 mV, 1 MHz squarewave to INPUT.
2.8 Repeat para. 4.4.4, Ops. 1.2 through to 2.4.

CHAPTER 5
COMPONENT LIST

Values of resistors are stated in ohms or multiples of ohms; ratings at 70°C are in watts or sub-multiples of watts. Values of capacitors are stated in sub-multiples of farad; ratings at 70°C. are in volts or kilovolts.

Whenever possible, exact replacements for components should be used, although locally available alternatives may be satisfactory for standard components.

Any order for replacement parts should include:

1. Instrument type
2. Instrument serial number
3. Component circuit reference
4. Component part number
5. Component Value

CIRCUIT REFERENCE BLOCKS

The table below gives the blocks of circuit references, so that the reader can relate the items listed in this chapter and their location in the circuitry and printed circuit boards in Chapter 6.

Circuit Reference		Circuit	Fig.	P.C. Board No.
From	To			
1	300	'X' Output Amplifier	2	126
301	350	Bright-up	3	128
351	400	E.H.T.	3	129
401	450	Power Supply	4	127
601	700	'Y' Amplifier	1	124
701	800	'Y' Amplifier	1	125

ABBREVIATIONS

BM	Button mica	CMP	Cermet preset	PS	Polystyrene
C	Carbon	E	Electrolytic	Se	Selenium
CP	Carbon preset	Ge	Germanium	Si	Silicon
CV	Carbon variable	MF	Metal film	SM	Silver mica
CER	Ceramic	MO	Metal oxide	WW	Wire-wound
CT	Ceramic trimmer	PE	Polyester	WWP	Wire-wound preset
CM	Cermet thick film	PP	Polypropylene	WWV	Wire-wound variable

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All requests for repairs or replacement parts should be directed to the Tektronix Field Office or representative in your area. This procedure will assure you the fastest possible service.

ELECTRICAL

Cir Ref	Part Number	Description Value F	Type	Tol %	Rating V
C1	285-1015-00	4·7 n	PE	20	160
C2	281-0710-00	10 n	CER		250
C3	285-0800-00	10 n	PE	20	250
C4	281-0734-00	100 n	CER		30
C5	281-0156-00	1·4-6·4 p	PP		500
C6	281-0710-00	10 n	CER		250
C7	285-0800-00	10 n	PE	20	250
C8	285-0915-00	100 n	PE	20	100
C9	285-0866-00	10 p	PS	1 p	350
C10	285-0854-00	100 p	PS	2 p	350
C11	281-0155-00	2-22 p	PP		500
1037 C12	285-0870-00	120 p	PS	2	350
C13	281-0157-00	5·5-65·5 p	PP		500
C14	281-0710-00	10 n	CER		250
C301	285-1014-00	1 μ	PE	20	63
C302	290-0495-00	47 μ	E		40
C303	281-0736-00	1 n	CER		8 k
C304	290-0495-00	47 μ	E		40
C305	285-0799-00	33 n	PE	20	250
C306	281-0681-00	10 n	CER		4 k
C307	285-0837-00	20 n	PE		5 k
C308	285-1015-00	4·7 n	PE	20	160
C309	281-0681-00	10 n	CER		4 k
C310	285-0837-00	20 n	PE		5 k
C311	281-0710-00	10 n	CER		250
C351	285-0800-00	10 n	PE	20	250
C352	281-0710-00	10 n	CER		250
C353	281-0183-00	0·5-3 p	CT		250
C354	285-0800-00	10 n	PE	20	250
C355	285-0800-00	10 n	PE	20	250
C401	285-0793-00	10 n	PE	20	630
C402	285-0793-00	10 n	PE	20	630
C403	285-0793-00	10 n	PE	20	630
C404	290-0547-00	330 μ	E		160

Cir Ref	Part Number	Description Value F	Type	Tol %	Rating V
C405	290-0624-00	2·2 m	E		40
C406	290-0624-00	2·2 m	E		40
C407	281-0710-00	10 n	CER		250
C408	290-0494-00	47 μ	E		25
C409	285-0915-00	100 n	PE	20	100
C411	290-0635-00	4·7 μ	E		63
C412	285-0870-00	120 p	PS	2	350
C413	285-0796-00	100 n	PE	20	250
C414	290-0556-00	22 μ	E		25
C415	290-0556-00	22 μ	E		25
C416	290-0625-00	4·7 μ	E		160
C601	281-0710-00	10 n	CER		250
C602	285-0800-00	10 n	PE	20	250
C603	285-0915-00	100 n	PE	20	100
C604	285-0800-00	10 n	PE	20	250
C605	285-0867-00	20 p	PS	1	350
C606	285-0867-00	20 p	PS	1	350
C607	285-0844-00	39 p	PS	2 p	350
C608	281-0155-00	2-22 p	PP		500
C609	281-0710-00	10 n	CER		250
C611	281-0710-00	10 n	CER		250
C701	285-0915-00	100 n	PE	20	100
C702	285-0800-00	10 n	PE	20	250
C703	285-0844-00	39 p	PS	2	350
C704	281-0154-00	2-12 p	PP		500
C705	285-0800-00	10 n	PE	20	250
C706	281-0710-00	10 n	CER		250
C707	281-0155-00	2-22 p	PP		500
C708	281-0710-00	10 n	CER		250
C709	285-0843-00	30 p	PS	2	350
C711	281-0155-00	2-22 p	PP		500
C712	285-0915-00	100 n	PE	20	100
C713	290-0625-00	4·7 μ	E		160
C714	281-0710-00	10 n	CER		250

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	Clr Ref	Part Number	Value V	Description	Type	Tol %	Rating
	D1	152-0062-01		1N914/1N4148	Si		75 V
	D2	152-0062-01		1N914/1N4148	Si		75 V
	D3	152-0062-01		1N914/1N4148	Si		75 V
	D4	152-0062-01		1N914/1N4148	Si		75 V
	D5	152-0062-01		1N914/1N4148	Si		75 V
	D6	152-0062-01		1N914/1N4148	Si		75 V
	D7	152-0062-01		1N914/1N4148	Si		75 V
	D301	152-0062-01		1N914/1N4148	Si		75 V
	D302	152-0468-00	150	Rectifier	Si		200 mA
	D303	152-0515-00	6 k	Rectifier	Si		10 mA
	D304	152-0515-00	6 k	Rectifier	Si		10 mA
	D305	152-0388-00	130	Zener	Si	5	330 mW
	D351	152-0062-01		1N914/1N4148	Si		75 V
	D352	152-0062-01		1N914/1N4148	Si		75 V
	D353	152-0544-00	43	Zener	Si	5	700 mW
	D354	152-0062-01		1N914/1N4148	Si		75 V
	D355	152-0062-01		1N914/1N4148	Si		75 V
(1171)	D356	152-0062-01		1N914/1N4148	Si		75 V
	D401	152-0341-00	450	Rectifier	Si		500 mA
	D402	152-0341-00	450	Rectifier	Si		500 mA
	D403	152-0341-00	450	Rectifier	Si		500 mA
	D404	152-0341-00	450	Rectifier	Si		500 mA
	D405	152-0341-00	450	Rectifier	Si		500 mA
	D406	152-0341-00	450	Rectifier	Si		500 mA
	D407	152-0341-00	450	Rectifier	Si		500 mA
	D408	152-0341-00	450	Rectifier	Si		500 mA
	D409	152-0341-00	450	Rectifier	Si		500 mA
	D411	152-0341-00	450	Rectifier	Si		500 mA
	D412	152-0341-00	450	Rectifier	Si		500 mA
	D413	152-0341-00	450	Rectifier	Si		500 mA
	D414	152-0348-00	6·2	Zener	Si		330 mW
	D415	152-0062-01		1N914/1N4148	Si		75 V
	D416	152-0062-01		1N914/1N4148	Si		75 V
	D417	152-0468-00	150	Rectifier	Si		200 mA
	D601	152-0062-01		1N914/1N4148	Si		75 V
	D602	152-0062-01		1N914/1N4148	Si		75 V
	D603	152-0062-01		1N914/1N4148	Si		75 V
	D604	152-0062-01		1N914/1N4148	Si		75 V
	D605	152-0062-01		1N914/1N4148	Si		75 V
	D606	152-0062-01		1N914/1N4148	Si		75 V
	D701	152-0546-00	47	Zener	Si	5	1
	D702	152-0472-00	5·6	Zener	Si	5	330 mW
	D703	152-0472-00	5·6	Zener	Si	5	330 mW
	D704	152-0543-00	5·1	Zener	Si	5	330 mW
	D705	152-0547-00	22	Zener	Si	5	330 mW

Cir Ref	Part Number	Value	Description	Rating	
FS401	159-0073-00	1 A (200-250 V)	1·25 in. fast		
	159-0069-00	2 A (100-125 V)	1·25 in. fast		
FS402	159-0073-00	1 A	1·25 in. fast		876
FB	276-0597-00	Ferrite bead Mullard FX1115			
L701	114-0323-00		Variable inductor		
L702	108-0700-00		Trace rotation coil 1920 turns		
LP401	150-0074-00	6·5 V	Les	1 W	
LP402	150-0074-00	6·5 V	Les	1 W	
LP403	150-0074-00	6·5 V	Les	1 W	

Cir Ref	Part Number	Value ohms	Description Type	Tol %	Rating W	
R1	317-0154-01	150 k	C	5	125 m	
R2	317-0822-01	8·2 k	C	5	125 m	
R3	317-0103-01	10 k	C	5	125 m	
R4	311-0717-00	220	CP	20	250 m	
R5	321-0280-48	8·06 k	MF	1	125 m	
R6	317-0683-01	68 k	C	5	125 m	
R7	317-0680-01	68	C	5	125 m	
R8	311-1346-00	10 k	CV	20	250 m	
R9	321-0093-42	90·9	MF	0·5	125 m	
R11	317-0393-01	39 k	C	5	125 m	
R12	317-0394-01	390 k	C	5	125 m	
R13	325-0123-00	10·1	MF	0·5	125 m	
R14	321-0844-48	2·2 k	MF	1	125 m	
*R15	311-1345-00	50 k	CV	20	250 m	
R16	317-0562-01	5·6 k	C	5	125 m	
R17	311-0802-00	4·7 k	CP	20	250 m	
R18	321-0845-48	2·7 k	MF	1	125 m	
R19	317-0152-01	1·5 k	C	5	125 m	
R21	317-0562-01	5·6 k	C	5	125 m	
R22	317-0512-01	5·1 k	C	5	125 m	
R23	311-0802-00	4·7 k	CP	20	250 m	
R24	317-0123-01	12 k	C	5	125 m	
R25	317-0123-01	12 k	C	5	125 m	
R26	321-0845-48	2·7 k	MF	1	125 m	
R27	311-0851-00	1 k	CP	20	250 m	
R28	321-0843-48	270	MF	1	125 m	
R29	311-0712-00	100	CP	20	250 m	

Cir Ref	Part Number	Value ohms	Description Type	Tol %	Rating W	
R31	321-0850-48	27 k	MF	1	125 m	
R32	321-0850-48	27 k	MF	1	125 m	
R33	307-0143-00	5·6 k	MO	5	1·5	
R34	307-0143-00	5·6 k	MO	5	1·5	
R35	317-0392-01	3·9 k	C	5	125 m	
R301	311-0850-00	15 k	CP	20	250 m	
R302	315-0223-01	22 k	C	5	250 m	
R304	301-0685-02	6·8 M	C	5	500 m	
R305	301-0685-02	6·8 M	C	5	500 m	
R306	317-0102-01	1 k	C	5	125 m	
R307	317-0124-01	120 k	C	5	125 m	
R308	317-0331-01	330	C	5	125 m	
R309	301-0685-02	6·8 M	C	5	500 m	
R310	316-0221-01	220	C	10	250 m	896
R311	317-0102-01	1 k	C	5	125 m	
R312	307-0184-00	15 k	MO	5	1·5	
R313	301-0685-02	6·8 M	C	5	500 m	
R314	317-0184-01	180 k	C	5	125 m	
R315	311-0910-00	2·2 M	CP	20	250 m	

* With S1

	Cir Ref	Part Number	Value ohms	Description Type	Tol %	Rating W
	R316	317-0273-01	27 k	C	5	125 m
	R317	301-0106-02	10 M	C	5	500 m
	R318	301-0106-02	10 M	C	5	500 m
	R319	301-0106-02	10 M	C	5	500 m
	R321	301-0106-02	10 M	C	5	500 m
	R322	301-0106-02	10 M	C	5	500 m
	R323	301-0825-01	8·2 M	C	5	500 m
	R324	301-0106-02	10 M	C	5	500 m
	R325	301-0106-02	10 M	C	5	500 m
	R326	301-0755-01	7·5 M	C	5	500 m
	R327	311-1347-00	2·5 M	CV	20	250 m
	R328	317-0104-01	100 k	C	5	125 m
	R329	311-1348-00	100 k	CV	20	250 m
	R331	317-0682-01	6·8 k	C	5	125 m
	R332	315-0335-02	3·3 M	C	5	250 m
	R333	315-0335-02	3·3 M	C	5	250 m
	R334	315-0335-02	3·3 M	C	5	250 m
	R351	311-1349-00	10 k	CV	20	250 m
	R352	315-0103-01	10 k	C	5	250 m
	R353	317-0183-01	18 k	C	5	125 m
	R354	317-0103-01	10 k	C	5	125 m
	R355	317-0104-01	100 k	C	5	125 m
	R356	317-0680-01	68	C	5	125 m
	R357	317-0123-01	12 k	C	5	125 m
	R358	317-0273-01	27 k	C	5	125 m
	R359	315-0153-01	15 k	C	5	125 m
	R361	317-0470-01	47	C	5	125 m
	R362	321-1325-48	24 k	MF	1	125 m
	R363	317-0123-01	12 k	C	5	125 m
	R364	317-0273-01	27 k	C	5	125 m
	R365	317-0102-01	1 k	C	5	125 m
	R366	317-0101-01	100	C	5	125 m
	R367	317-0101-01	100	C	5	125 m
(1171)	R368	317-0561-01	560	C	5	125 m
	*R401	311-0709-00	25	WWV	10	1
	R402	317-0683-01	68 k	C	5	125 m
	R403	317-0562-01	5·6 k	C	5	125 m
	R404	317-0223-01	22 k	C	5	125 m
	R405	308-0726-00	1·5	WW	10	1
794	R406	308-0725-00	2·7	WW	10	1
	R407	308-0727-00	1	WW	10	1
	R408	317-0274-01	270 k	C	5	125 m
	R409	317-0100-01	10	C	5	125 m
	R410	317-0471-01	470	C	5	125 m

*With S401

Cir Ref	Part Number	Value ohms	Description Type	Tol %	Rating W	
R411	317-0332-01	3·3 k	C	5	125 m	
R412	317-0334-01	330 k	C	5	125 m	79
R413	307-0370-00	180	MO	5	6	
R414	315-0472-02	4·7 k	C	5	250 m	
R415	307-0144-00	10 k	MO	5	1·5	
R416	317-0562-01	5·6 k	C	5	125 m	
R417	317-0103-01	10 k	C	5	125 m	
R418	317-0822-01	8·2 k	C	5	125 m	
R419	316-0183-01	18 k	C	10	250 m	
R421	317-0104-01	100 k	C	5	125 m	
R422	317-0683-01	68 k	C	5	125 m	
R423	317-0103-01	10 k	C	5	125 m	
R424	321-0318-48	20 k	MF	1	125 m	
R425	311-1378-00	4·7 k	WWP	10	1	
R426	321-1325-48	24 k	MF	1	125 m	
R427	321-0871-48	6·8 k	MF	1	125 m	
R428	311-1419-00	1·5 k	WWP	10	1	
R429	321-1313-48	18 k	MF	1	125 m	
R431	316-0473-01	47 k	C	10	250 m	
R432	321-1353-48	47 k	MF	1	125 m	
R433	311-1378-00	4·7 k	WWP	10	250 m	
R434	321-0289-48	10 k	MF	1	125 m	
R601	316-0332-01	3·3 k	C	10	250 m	
R602	317-0334-01	330 k	C	5	125 m	
R603	317-0562-01	5·6 k	C	5	125 m	
R604	317-0562-01	5·6 k	C	5	125 m	
R605	317-0242-01	2·4 k	C	5	125 m	
R606	317-0242-01	2·4 k	C	5	125 m	
R607	317-0681-01	680	C	5	125 m	
R608	317-0821-01	820	C	5	125 m	
R609	311-1377-00	10 k	CP	20	250 m	
R611	321-0968-48	91	MF	1	125 m	
R612	321-0968-48	91	MF	1	125 m	
R613	317-0152-01	1·5 k	C	5	125 m	
R614	311-0719-00	470	CP	20	250 m	
R615	317-0152-01	1·5 k	C	5	125 m	
R616	317-0221-01	220	C	5	125 m	
R617	317-0183-01	18 k	C	5	125 m	
R618	317-0221-01	220	C	5	125 m	
R619	317-0221-01	220	C	5	125 m	
R621	317-0222-01	2·2 k	C	5	125 m	
R622	317-0221-01	220	C	5	125 m	
R623	317-0470-01	47	C	5	125 m	
R624	307-0173-00	470	MO	5	1·5	
R625	317-0470-01	47	C	5	125 m	
R626	317-0221-01	220	C	5	125 m	
R627	317-0221-01	220	C	5	125 m	
R628	317-0820-01	82	C	5	125 m	
R629	317-0820-01	82	C	5	125 m	

Cir Ref	Part Number	Value ohms	Description Type	Tol %	Rating W
R701	321-0095-48	95·3	MF	1	125 m
R702	317-0101-01	100	C	5	125 m
R703	321-0095-48	95·3	MF	1	125 m
R704	317-0332-01	3·3 k	C	5	125 m
R705	315-0821-01	820	C	5	250 m
R706	311-0719-00	470	CP	20	250 m
R707	315-0821-01	820	C	5	250 m
R708	311-0765-00	100 k	CP	20	250 m
R709	317-0333-01	33 k	C	5	125 m

Cir Ref	Part Number	Value ohms	Description Type	Tol %	Rating W
R711	317-0362-01	3·6 k	C	5	125 m
R712	317-0121-01	120	C	5	125 m
R713	317-0121-01	120	C	5	125 m
R714	317-0470-01	47	C	5	125 m
R715	317-0121-01	120	C	5	125 m
R716	307-0372-00	390	MO	5	3·5
R717	307-0372-00	390	MO	5	3·5
R718	317-0680-01	68	C	5	125 m
R719	317-0680-01	68	C	5	125 m
R721	317-0680-01	68	C	5	125 m
R722	311-0719-00	470	CP	20	250 m
R723	315-0103-01	10 k	C	5	250 m
R724	307-0371-00	510	MO	5	5
R725	307-0371-00	510	MO	5	5
R726	307-0369-00	160	MO	5	1·5
R727	311-1344-00	1 k	WWP	20	1·6
R728	307-0369-00	160	MO	5	1·5

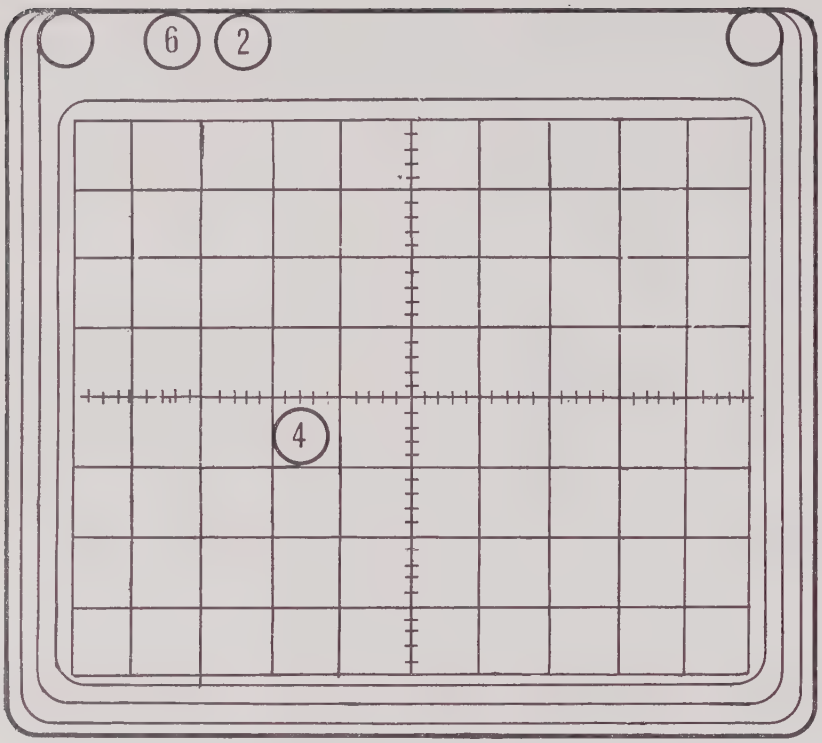
Cir Ref	Part Number	Description
S1	311-1345-00	Pull (with R15)
S2	260-1408-00	Push (1-button)
S401	311-0709-00	Rotary with R401)

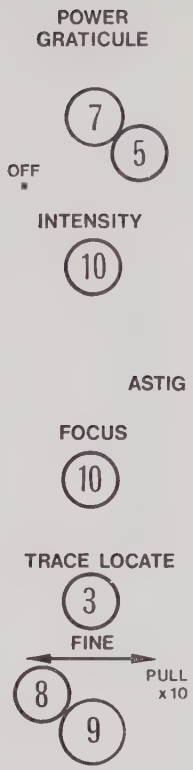
Cir Ref	Part Number	Description
T301	120-0771-00	E.H.T. oscillator transformer
T401	120-0770-00	Power transformer
TH301	307-0258-00	Thermistor NTC 130 Ω

Cir Ref	Part Number	Description		
TR1	151-0326-00	BC107	Si	NPN
TR2	151-0326-00	BC107	Si	NPN
TR3	151-0317-00	BC109C	Si	NPN
TR4	151-0320-01	MPS6518 Motorola	Si	PNP
TR5	151-0320-01	MPS6518 Motorola	Si	PNP
TR6	151-0257-00	BF305 Ates	Si	NPN
TR7	151-0257-00	BF305 Ates	Si	NPN
TR8	151-0257-00	BF305 Ates	Si	NPN
TR9	151-0257-00	BF305 Ates	Si	NPN
TR301	151-0326-00	BC107	Si	NPN
TR302	151-0317-00	BC109C	Si	NPN
TR303	151-0317-00	BC109C	Si	NPN
TR304	151-0400-00	2N5191	Si	NPN

980

	Clr Ref	Part Number	Description		
980	TR351	151-0257-00	BF305 Ates	Si	NPN
	TR352	151-0326-00	BC107	Si	NPN
	TR353	151-0404-00	T0203	Si	PNP
980	TR354	151-0257-00	BF305 Ates	Si	NPN
	TR355	151-0404-00	T0203	Si	PNP
1089	TR401	151-0257-01	BF305 Ates	Si	NPN
	TR402	151-0404-00	TZ0203	Si	PNP
	TR403	151-0326-00	BC107	Si	NPN
	TR404	151-0326-00	BC107	Si	NPN
	TR405	151-0400-00	2N5191	Si	NPN
	TR406	151-0318-00	BFY51	Si	NPN
	TR407	151-0317-00	BC109C	Si	NPN
	TR408	151-0326-00	BC107	Si	NPN
	TR409	151-0318-00	BFY51	Si	NPN
	TR411	151-0317-00	BC109C	Si	NPN
980	TR412	151-0257-00	BF305 Ates	Si	NPN
	TR413	151-0400-00	2N5191	Si	NPN
	TR414	151-0320-00	MPS6518	Si	PNP
	TR415	151-0311-00	MJE340	Si	NPN
	TR416	151-0311-00	MJE340	Si	NPN
	TR601	151-0320-01	MPS6518 Motorola	Si	PNP
	TR602	151-0320-01	MPS6518 Motorola	Si	PNP
	TR603	151-0127-02	BSX20/2N2369	Si	NPN
	TR604	151-0127-02	BSX20/2N2369	Si	NPN
	TR701	151-0127-02	BSX20/2N2369	Si	NPN
	TR702	151-0127-02	BSX20/2N2369	Si	NPN
	TR703	151-0127-02	BSX20/2N2369	Si	NPN
	TR704	151-0127-02	BSX20/2N2369	Si	NPN
884	TR705	151-0310-01	E1530LL	Si	NPN
	TR706	151-0310-01	E1530LL	Si	NPN
1021	V301	154-0640-05	CRT Tektronix T7400-31-2		





PANEL, FRONT.

MECHANICAL

Part Number	Description	Location
381-0334-00	Bar, Handle	
136-0304-00	Base	
136-0183-01	Base Transistor, T05	PCB
136-0343-00	Base Transistor, T018	PCB
361-0254-00	Bead, Ceramic	PC127
276-0597-00	Bead, Ferrite	PC125
200-1218-01	Bezel	
200-1218-02	Bezel, Marked	2
366-1403-00	Button, Push	3
358-0460-00	Bush, Panel	Handle
377-0386-00	Bush, Thread, 4 BA	
390-0277-00	Cabinet, Side	
334-1305-00	Card, Instruction	Accessory
343-0196-00	Clamp, Cable (Brass)	Delay line
343-0198-00	Clamp, Cable Tie Down	Delay line
344-0247-00	Clip, Fuse	PC127
200-0904-00	Connector, Cap PDA	EHT
131-1282-01	Connector, Edge 16 Way Socket	PC124
131-0649-00	Connector, Male BNC	Accessory
131-0650-01	Connector, BNC	Z Mod.
131-0644-00	Connector, PDA Button	EHT

875

	Part Number	Description	Location
1173	131-1557-00	Contact, Earth	
	131-1259-00	Contact, Earth	
	200-1005-00	Cover	
	378-0719-01	Filter	4
	252-0606-00	Foam Rubber, $\frac{1}{4}$" x $\frac{1}{4}$"	CRT
	348-0169-00	Foot, Front (Grey)	
	348-0168-00	Foot, Rear (Grey)	
	348-0160-00	Grommet, $\frac{3}{8}$" id.	EHT
	348-0161-00	Grommet, $\frac{1}{8}$" id.	EHT & CRT
	367-0168-00	Handle	
	136-0311-00	Holder, Bulb	5
	352-0152-00	Holder, Fuse	PC127
	352-0160-00	Holder, Lamp	6
1049	342-0156-00	Insulator, Stand Off	
	003-0674-00	Key, Allen 1·5 mm A/F	7 - 10
888	131-1364-00	Key, Polarizing	Interface
	366-1239-01	Knob, Neutral Grey	7
	366-1254-00	Knob, Grey	8
	366-1255-00	Knob, Red	9
	366-1266-00	Knob, Grey	10
	105-0348-00	Latch, Grey	
	195-0105-00	Lead Set, CRT Deflection (X Plate)	
	195-0106-00	Lead Set, CRT Deflection (Y Plate)	
	210-0291-00	Lug, Pillar	EHT
	004-1142-00	Packaging	Accessory
	386-2407-00	Plate, Spring	
	131-0865-00	Pin, Terminal	CRT X
	134-0135-00	Plug, Mains	
	134-0097-00	Plug, 8 Way	
	213-0248-00	Screw, Socket, 3 x 3 mm	7 - 10
	166-0464-00	Sleeve	Graticule
	131-1325-00	Socket, 8 Way	
	131-1268-00	Socket, 2 mm.	11
	136-0448-00	Socket and Lead, U.K.	
	136-0448-01	Socket and Lead, U.S.A.	
	344-0246-00	Spirel Fix (Push-On)	
	385-0215-00	Spacer, 6 BA x 5·0 mm	PC125
	385-0209-00	Spacer, $\frac{3}{8}$" x 11 mm	
	361-0413-00	Spacer, $\frac{3}{8}$" x 25 mm	
	361-0198-00	Spacer, 6 BA x $\frac{3}{8}$"	EHT
	385-0206-00	Spacer, 6 BA 8 BA x ·5$\frac{3}{8}$	
	361-0202-00	Spacer, 6 BA x 1·0"	
	361-0283-00	Spacer, Mounting	
	361-0197-00	Spacer, 4 BA Clear x $\frac{1}{2}$"	
	214-1080-00	Spring, 1" lg.	Graticule
	252-0607-00	Strip, PVC Edging	CRT Shield
	355-0167-01	Stud, 6 BA x 52 mm	EHT
1030	124-0289-00	Tag strip, 4-way	
	210-0275-00	Tag, Solder, $\frac{3}{8}$"	
	253-0108-00	Tape, PVC Adhesive, 1" wide	CRT
	210-1075-00	Washer, Foot Packing	
	210-1086-00	Washer, Locking	Astig

ASSEMBLIES

	Assembly	Part Number	Includes Circuit References
1183	Bright-up PC128	670-2182-01	C351 to C355, D351 to D356, R353 to R359, R361 to R368, TR351 to TR355
	EHT PC129	670-2183-00	C301 to C309, D301, D302, L301, R301, R309, R311 to R319, R321 to R326, R332 to R334, TR301 to TR304
	Graticule Light	352-0160-00	L402, L403
	Mother Board PC124	670-2178-00	C601 to C609, C611, D601 to D605, R601 to R609, R611 to R619, R621 to R629, SKT601, SKT602, TR601 to TR604
	Power Board PC127	670-2181-00	C401 to C409, C411 to C416, D401 to D409, D411 to D417, FS402, R402 to R419, R421 to R429, R431 to R434, TR401 to TR409, TR411 to TR416
	Quintupler	650-0021-00	Sealed unit.
	'Y' Output PC125	670-2179-00	C701 to C709, C711, C712, D701 to D704, R701 to R709, R711 to R719 R721 to R723, R726 to R728, TR701 to TR704
	'X' Output PC126	670-2180-00	C1 to C9, C11 to C14, D1 to D7, R1 to R7, R11, R12, R14, R16 to R19, R21 to R29, R31 to R35, TR1 to TR9

CHAPTER 6

CIRCUIT DIAGRAMS

To minimize the risk of misinterpretation of component values on circuit diagrams, the decimal point has been replaced by the multiplier or sub-multiplier of the basic unit. For instance, 2·2 megohms is shown as 2M2 and 1·8 picofarads is shown as 1p8.

To aid the reader further, in addition to the block Circuit Reference Table in Chapter 5.1, to locate a component in the circuit diagrams, a table is provided at the top of each circuit diagram, in which the circuit reference will appear, where practicable, directly above the component being sought.

PRINTED CIRCUIT

Blue shows the rear track as seen through the board. Yellow the component side track.

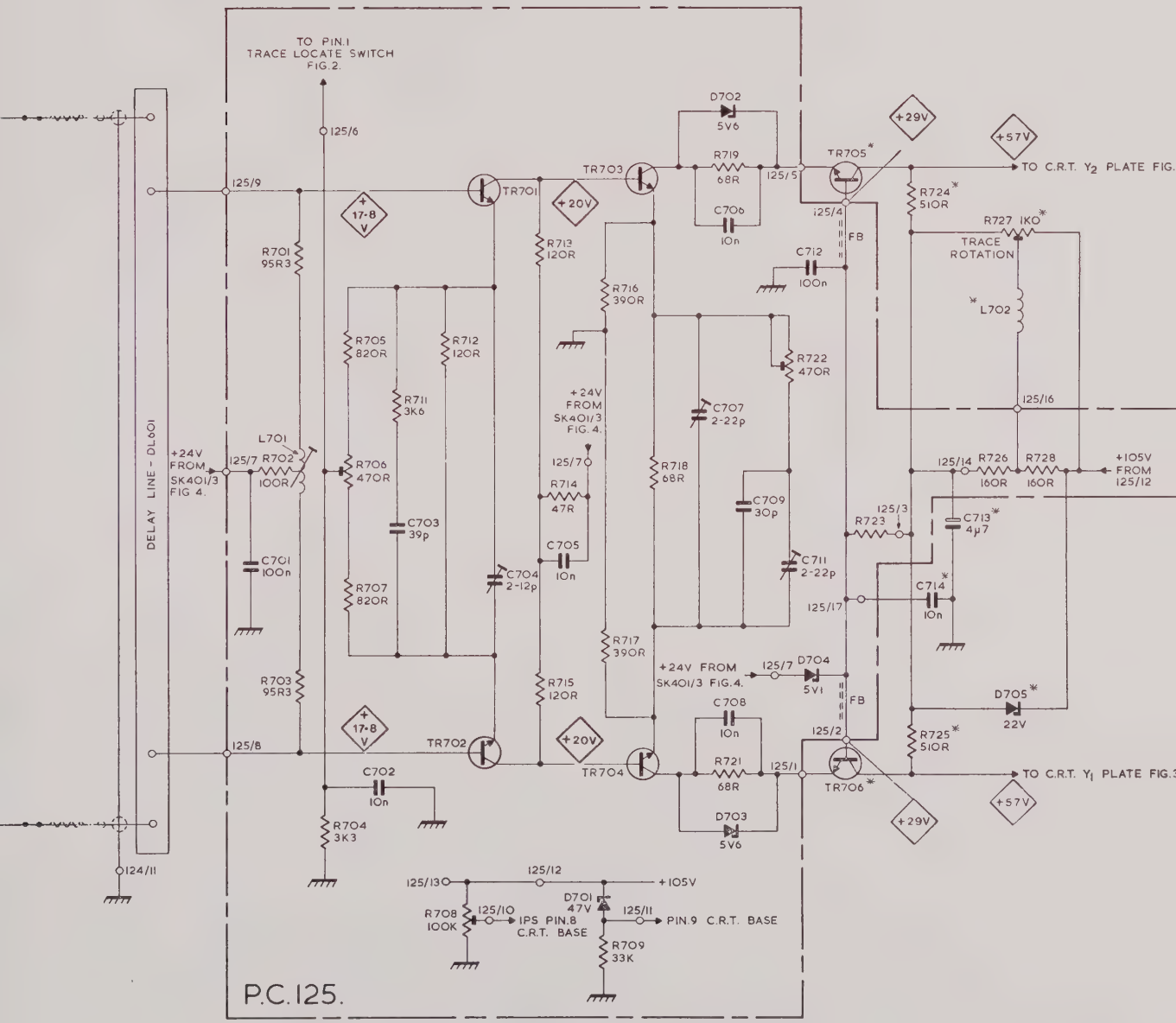
Component locations are given on the page preceding the Figure 5.

WAVEFORMS

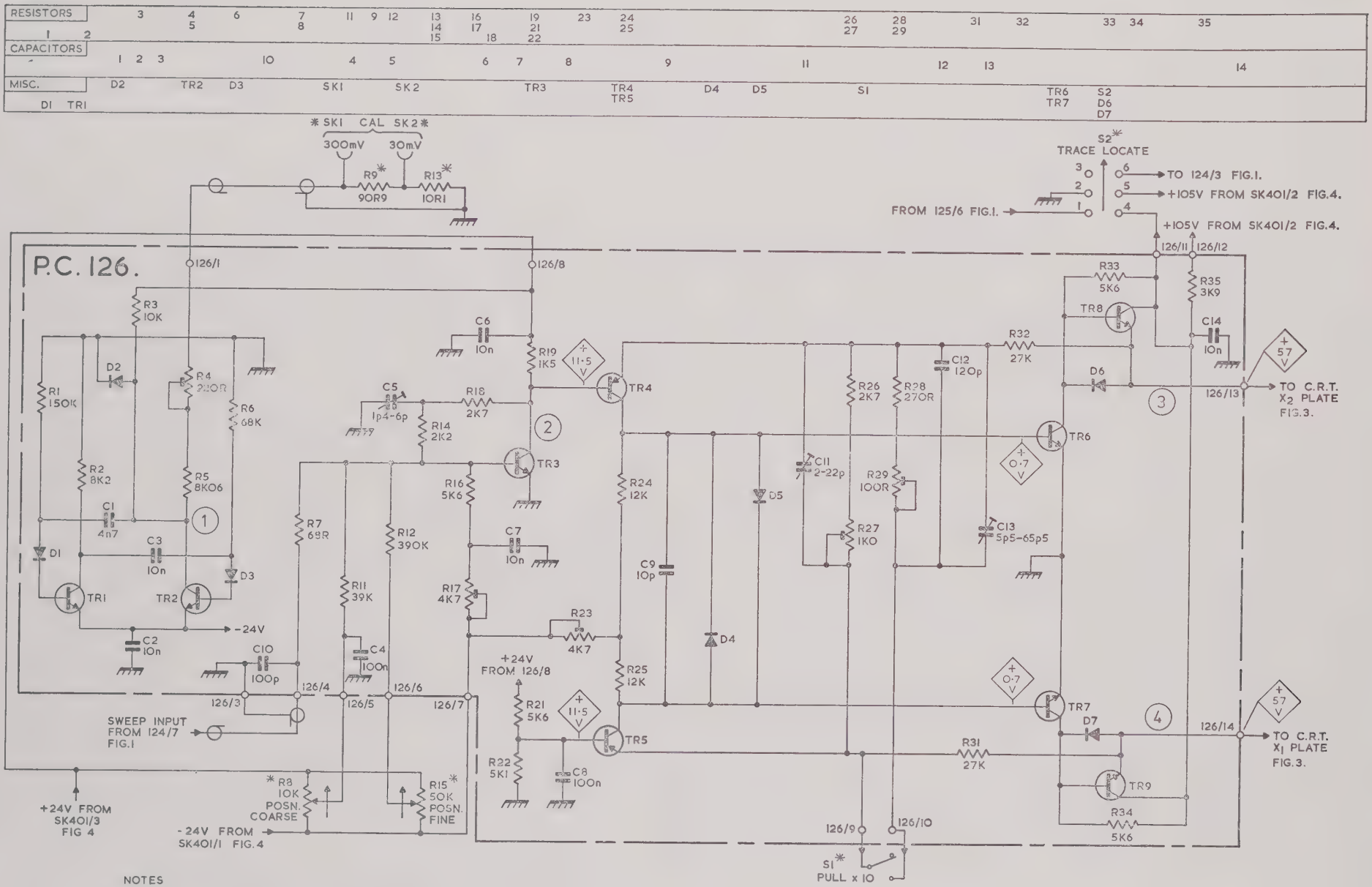
Waveforms, illustrated in Plate 6/1, may be monitored at point with the corresponding number.

| | | |

	701 704 711 708 713 709 718 719 722 723 724 702 705 712 714 721 725 726 703 706 715 716 727 707 717 728	
	701 702 704 705 706 711 713 703 707 709 714 708	
DL601	L701 TR701 TR703 D702 TR704 L702 TR702 TR704 D703 TR706 D701 D704 D705	



MAIN 'Y' AMPLIFIER — D83
FIG. 1.



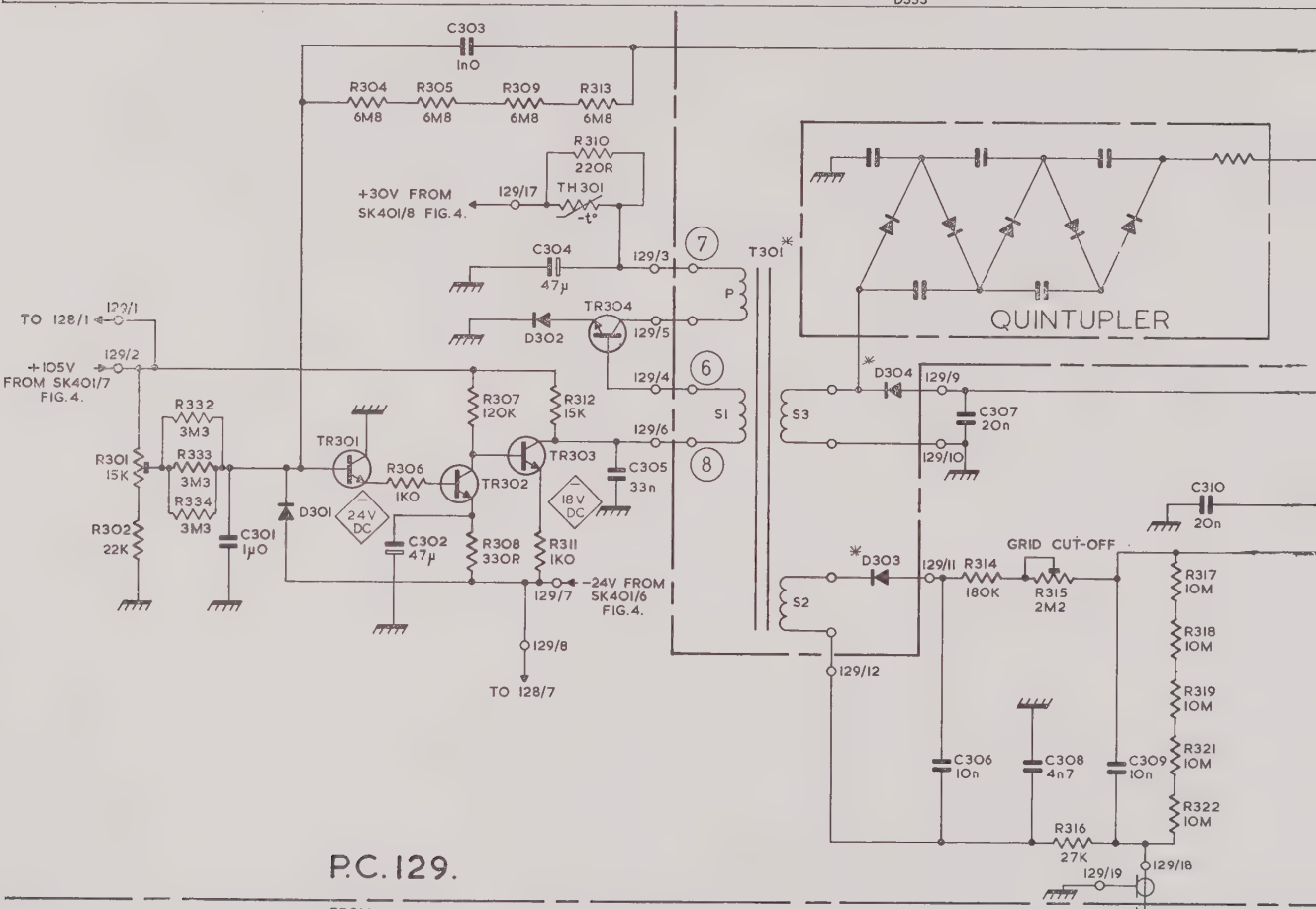
NOTES

1 * DENOTES COMPONENTS NOT MOUNTED ON P.C. BOARD

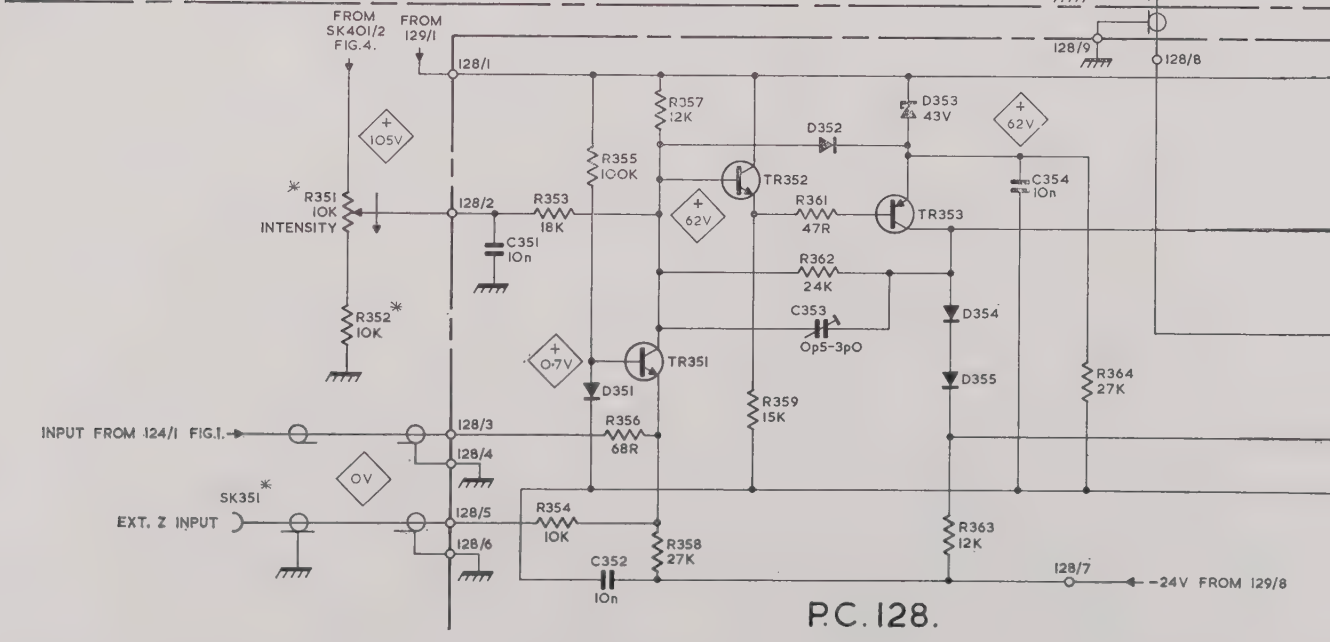
2 126/2 DENOTES P.C. BOARD/EYELET OR TERMINAL No

'X' AMPLIFIER & CALIBRATOR – D83 FIG. 2.

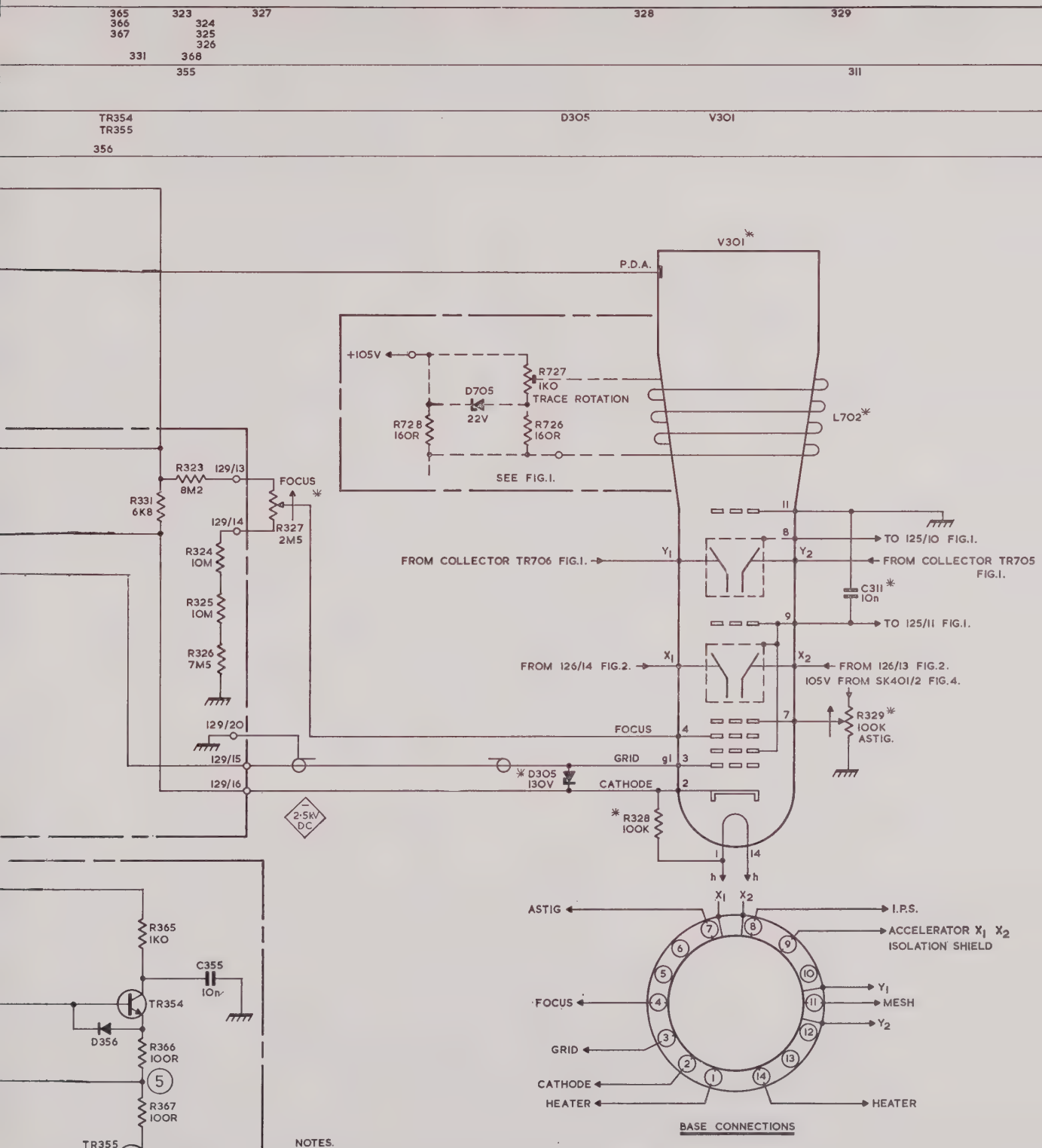
RESISTORS	301 302 332 333 334 304 351 352 305 306 307 308 309 311 312 313 353 356 354 310 355 357 358 359 361 362 363 314 315 316 364 317 318 319 321 322
CAPACITORS	301 302 303 351 304 352 305 353 306 307 308 354 309
MISC.	SK351 D301 TR301 TR302 TR303 D302 D351 TR304 TH301 TR351 T301 TR352 D352 D303 D304 TR353 D353 D354 D355



P.C.129.



P.C.128.



NOTES.
1. * DENOTES COMPONENTS NOT MOUNTED ON P.C. BOARD.
2. 128/4 DENOTES P.C. BOARD/EYELET OR TERMINAL No.

QUINTUPLER, E.H.T.-P.C.129, BRIGHT-UP-P.C.128, & C.R.T. —D83

FIG. 3.

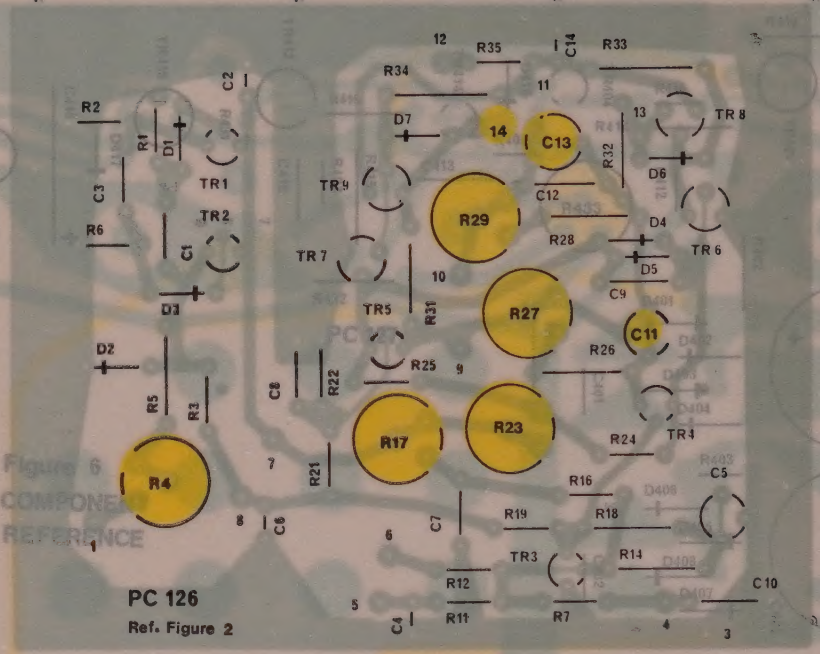
| | | |

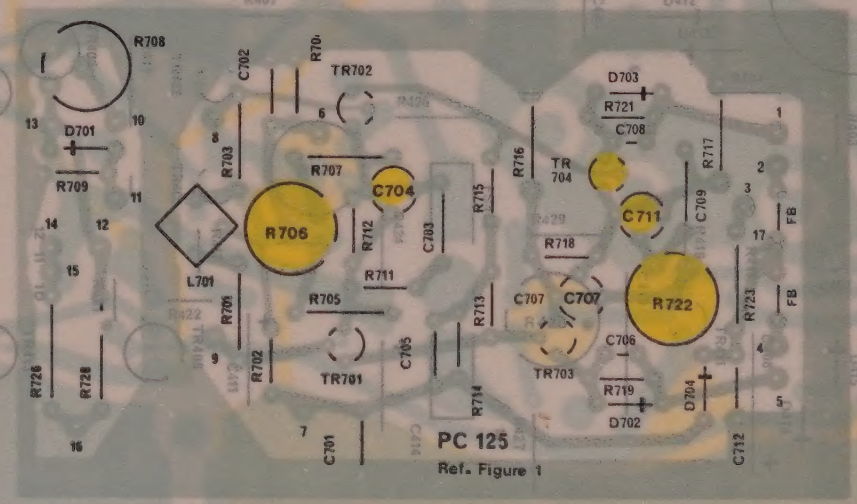
LOCATION OF COMPONENTS ON PRINTED CIRCUITS

Cir Ref	Grid Location	Cir Ref	Grid Location	Cir Ref	Grid Location	Cir Ref	Grid Location	Cir Ref	Grid Location	Cir Ref	Grid Location	Cir Ref	Grid Location	Cir Ref	Grid Location
C1	5—E2	C413	6—F1	D305						R356	6—C1			R718	5—G5	TR355	6—B2
C2	5—E1	C414	6—F6			FS402	6—F5	R31	5—F2	R357	6—C1			R719	5—G6		
C3	5—E1	C415	6—G6					R32	5—G1	R358	6—C2	R601	5—C2				
C4	5—F3	C416	6—E1	D351	6—C1			R33	5—G1	R359	6—C2	R602	5—D2	R721	5—G5		
C5	5—G3			D352	6—C1			R34	5—F1			R603	5—C3	R722	5—G5	TR401	6—G1
C6	5—E3			D353	6—B1	FB	5—G5	R35	5—F1	R361	6—C2	R604	5—C2	R723	5—G5	TR402	6—E4
C7	5—F3			D354	6—B2					R362	6—C2	R605	5—C4	R724		TR403	6—H5
C8	5—E2	C601		D355	6—B2	L301				R363	6—B2	R606	5—C3	R725		TR404	6—G1
C9	5—G2	C602	5—B4							R364	6—B1	R607	5—C3	R726	5—E6	TR405	6—D4
C10	5—G3	C603						R301	6—C4	R365	6—B1	R608	5—C5	R727		TR406	6—D4
C11	5—G2	C604						R302	6—C4	R366	6—B1	R609	5—B5	R728	5—E6	TR407	6—H5
C12	5—G2	C605	5—C5	D401	6—G2	L701	5—E5			R367	6—B1					TR408	6—E5
C13	5—F1	C606	5—C4	D402	6—G2	L702		R304	6—C3			R611	5—C5			TR409	6—E6
C14	5—G1	C607	5—D5	D403	6—G2			R305	6—C3			R612	5—C4				
		C608	5—C5	D404	6—G3			R306	6—C4			R613	5—C5	S1	X10	TR411	6—G5
		C609	5—C5	D405	6—G3			R307	6—C4	R401	S401	R614	5—B5	S2	Trace	TR412	6—E1
				D406	6—G3	LP401		R308	6—C4	R402	6—G2	R615	5—B5		Locate	TR413	6—D6
C301	6—C3	C611	5—C4	D407	6—G3	LP402		R309	6—C3	R403	6—G3	R616	5—C5			TR414	6—F1
C302	6—D4			D408	6—G3	LP403				R404	6—G4	R617	5—D4	S401	On/off	TR415	6—E1
C303	6—C4			D409	6—G4			R311	6—C5	R405	6—H5	R618	5—C4			TR416	6—D1
C304	6—D5	C701	5—F6					R312	6—C5	R406	6—H1	R619	5—D5				
C305	6—D5	C702	5—E4	D411	6—G4			R313	6—B3	R407	6—E4			T301			
C306	6—B5	C703	5—F5	D412	6—G4	R1	5—E1	R314	6—C5	R408	6—F1	R621	5—C4				
C307	6—A3	C704	5—F5	D413	6—G4	R2	5—E1	R315	6—C5	R409	6—H1	R622	5—D4			TR601	5—D4
C308		C705	5—F6	D415	6—H6	R3	5—E2	R316	6—A5	R410	6—G1	R623	5—C5	T401		TR602	5—C3
C309	6—B5	C706	5—G6	D414	6—G6	R4	5—E3	R317	6—B6	R411	6—G5	R624	5—D5			TR603	5—C3
C310	6—B4	C707	5—G5	D416	6—F1	R5	5—E2	R318	6—B6	R412	6—G2	R625	5—C4			TR604	5—C4
C311		C708	5—G5	D417	6—E1	R6	5—E2	R319	6—B6	R413	6—E4	R626	5—D4				
		C709	5—G5			R7	5—G3			R414	6—G1	R627	5—D4	TR1	5—E1		
						R8	Coarse	R321	6—A6	R415	6—F1	R628	5—D4	TR2	5—E2		
		C711	5—G5			R9		R322	6—A5	R416	6—G1	R629	5—D5	TR3	5—G3	TR701	5—F6
C351	6—C2	C712	5—G6	D601	6—C4			R323	6—B3	R417	6—E5			TR4	5—G2	TR702	5—F4
C352	6—C2	C713		D602	6—C3	R11	5—F3	R324	6—B4	R418	6—G5			TR5	5—F2	TR703	5—F6
C353	6—B1	C714		D603	6—C3	R12	5xF3	R325	6—B4	R419	6—F1			TR6	5—G2	TR704	5—G5
C354	6—B1			D604	6—C3	R13		R326	6—A4			R701	5—E5	TR7	5—F2	TR705	
C355	6—B1			D605	6—B5	R14	5—G3	R327		R421	6—E5	R702	5—E6	TR8	5—G1	TR706	
				D606	6—D2	R15	Fine	R328		R422	6—E5	R703	5—E5	TR9	5—F1		
		D1	5—E1			R16	5—G3	R329		R423	6—F1	R704	5—F4				
		D2	5—E2			R17	5—F3			R424	6—F5	R705	5—F5				
C401	6—G2	D3	5—E2			R18	5—G3	R331	6—B4	R425	6—F5	R706	5—E5			V301	
C402	6—G3	D4	5—G2	D701	6—E5	R19	5—F3	R332	6—C4	R426	6—F5	R707	5—F5	TR301	6—C4		
C403	6—G4	D5	5—G2	D702	6—G6			R333	6—C4	R427	6—F6	R708	5—E4	TR302	6—C4		
C404	6—H2	D6	5—G1	D703	6—G4	R21	5—F3	R334	6—C4	R428	6—F5	R709	5—E5	TR303	6—C5		

C406	6—H4			D705		R23	5—F3					R711	5—F5		
C407	6—H5					R24	5—G3			R431	6—E1	R712	5—F5		
C408	6—G6					R25	5—F2	R351		R432	6—F2	R713	5—F5		
C409	6—E5	D301	6—D4			R26	5—G2	R352		R433	6—G2	R714	5—F6	TR351	6—C1
		D302	6—D6	FS401		R27	5—F2	R353	6—C1	R434	6—F2	R715	5—F5	TR352	6—C1
C411	6—E6	D303				R28	5—G2	R354	6—C1			R716	5—F5	TR353	6—B1
C412	6—E2	D304				R29	5—F2	R355	6—C1			R717	5—G5	TR354	6—B1

Figure 5
COMPONENT
REFERENCE





REFERENCE COMPONENT
Figure 2

PC 151

PC 158

PC 158

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